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AUTHOR	Young, John W.
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ABSTRACT

In this study, two statistical approaches for adjusting grades were tested on data obtained from four law schools, with samples of 157, 188, 206, and 191. These approaches were previously validated using data on undergraduates but have not been used in a study of postgraduate performance. Neither method yielded consistent improvements in the predictive validity of Law School Admission Test (LSAT) scores and undergraduate grades. The single exception was for School D, where a significant improvement in the correlation of test scores with law school grades was observed. Two appendixes contain data from the law schools. (Contains 7 tables and 18 references.) (Author/SLD)

LSAC RESEARCH REPORT SERIES

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Statistical Adjustments of Law School Grade Point Averages

Abstract

In this study, two statistical approaches for adjusting grades were tested on data obtained from four law schools. These approaches were previously validated using data on undergraduates but have not been used in a study of postgraduate performance. Neither method yielded consistent improvements in the predictive validity of LSAT scores and undergraduate grades. The single exception was for School D where a significant improvement in the correlation of test scores with law school grades was observed.

Introduction

For any standardized testing program, one benchmark of the usefulness of the test scores is the validity of the scores to predict some important future outcome, a form of test validity known as predictive validity. In the case of LSAT scores, one important indicator of its predictive validity is in forecasting law school grades for enrolled students. As in many other situations concerned with the predictive validity of admissions information, institutional studies typically use multiple regression analysis to determine the validity of test scores and some prior measure of classroom performance (such as undergraduate grades) in predicting future academic performance (such as law school grades) for a cohort of students.

A vast literature exists on the prediction of academic performance, both at the undergraduate and postgraduate level (see e.g., Ramist (1985) and Schrader (1971) for summaries of the research over the past three decades). Earlier predictive validity studies of LSAT scores were conducted by Boldt (1976) and Linn and Hastings (1984).

One limitation of many past predictive validity studies, conducted both at colleges and at law schools, has been the reliance on first year grade point average (GPA) as the criterion (Wilson, 1983). The first year GPA has been favored in institutional studies because it is a well-defined criterion, it is easily obtainable from university records, and it is available relatively soon after the matriculation of a class of students. However, the first year GPA is neither a sufficient nor an adequate measure of a student's overall achievement. On the surface, the cumulative GPA computed across all semesters enrolled would appear to offer several advantages over the first year GPA as a criterion. However, few studies involving prediction of cumulative GPA have been conducted because the cumulative GPA is known to be a problematic criterion. Because each student's GPA is based on a different combination of courses, each with a unique grade distribution, the construct validity of the GPA scale is diminished. Hence, a criterion needs to be developed which takes into account the differences in course grading standards.

Criticisms about the effectiveness of preadmission measures generally focus only on the limitations of the predictors. However, the controversy over the validity of standardized tests has not properly taken into account the fact that the GPA criterion has certain correctable defects. One of the basic facts in measurement is that a variable with significant measurement error will have substantially reduced correlation with other measures (Cronbach, 1984). By statistically eliminating some of the unreliability in the grading process that results in course differences, we can expect that the apparent size of predictive validity coefficients will increase significantly.

This particular study of predicting law school academic performance was unique because it utilized two different statistical approaches developed by the author for adjusting the cumulative GPA. These two methods have been empirically tested on data relating undergraduate grades (Young, 1990, 1992) but have not been used in a study of postgraduate performance. The use of grade adjustment methods, both by the author and by other researchers, has proven useful in understanding the observed phenomenon of differential predictive validity by gender and by race (Elliott & Strenta, 1988; Young, 1991a, 1991b).

Data for this study were obtained from four accredited law schools in the United States: two of the schools are located in the Northeast (Schools C and D), one is located in the South (School B), and the fourth is located in the West (School A). The names of the schools have been masked since identification of the specific institutions is not essential in understanding the results of this study. The cohort from each of these institutions is described below.

The Participating Institutions

Three of the four law schools in this study, Schools B, C, and D, are affiliated with their state-supported flagship public university. The fourth law school, School A, is part of a private university which is church-affiliated. All four law schools are of moderate size with typical entering classes for the J.D. program of about 150–200 students per year. There is no assumption that these four schools are a representative sampling of any universe of law schools.

Data for School A (N = 157), School C (N = 188), and School D (N = 206) are for their respective entering classes of 1987 and would typically be expected to graduate in the Spring of 1990. Data for School B (N = 191) are for its entering class of 1989 with these students typically graduating in 1992. It would have been preferable to obtain data for the comparable cohort of students at School B as at the other institutions. However, due to extensive delays in obtaining data from School B, the information that was most readily available at the time of data collection was for its most recent cohort of graduates. Although the data from School B are somewhat more recent than for the other law schools, this does not appear to have substantially influenced the results of the study.

The Adjustment Methods

The two statistical methods for adjusting grades used in this study are based on: (1) Item Response Theory (IRT), a measurement model, and (2) the General Linear Model (GLM), a statistical model. The first method yields an adjusted cumulative GPA known as the **IRT-Based GPA**; the second method yields an index called the **LS-GPA** (LS stands for Least-Squares). This terminology is consistent with that used in earlier studies using these two approaches. A brief description of the theory and development of each of these adjusted grade composites is given below. For a more complete treatment, the reader is referred to Young (1990, 1992). In addition to the two methods developed by the author, other researchers have developed similar methodologies for adjusting grades (see Young, 1993, for a relevant review).

The IRT-Based GPA

IRT was developed some forty years ago as an alternative to classical test theory in order to better handle some of the pressing problems in measurement that were unresolved. The author's doctoral dissertation (Young, 1989) is the first documented application of IRT to the problem of equating grades from different courses from the same institution onto a common scale. The IRT model used in this study is the rating scale version (Muraki, 1990) of Samejima's (1969) Graded Response Model (GRM). The GRM is an appropriate model for course grades because it appears likely that the underlying assumptions of the model can be met.

The data for this study correspond to an IRT framework in the following manner: Each student can be considered to be equivalent to an examinee, while each law school course can be considered equivalent to a test item with polytomous responses represented by the grade earned in that course. Since students, primarily because they major in different fields, enroll for different combinations of courses, we are faced with a situation analogous to that found in matrix sampling testing programs where examinees attempt different sets of items. IRT is especially well-suited for handling this problem of creating a common metric regardless of which courses or items were taken.

The operating assumption of the GRM is that when an individual encounters a test item, a latent variable is induced. The probability that this variable takes on a value greater than the k-th category boundary depends on the person's ability, the value of the k-th category boundary, and the item's discrimination. In the rating scale version of the GRM, the distance between category boundaries is assumed to be equal across all items. The GRM has the following important advantage over models for dichotomous scoring: When data can be scored in three or more ordered categories, the model can yield a more precise estimate of an individual's ability than can be obtained by scoring data dichotomously.

The rating scale version of the Graded Response Model has the following form:

$$\pi_{nki} = \frac{\exp\left(\alpha_i\left(\Theta_n - \left(\beta_i + \tau_k\right)\right)\right)}{1 + \exp\left(\alpha_i\left(\Theta_n - \left(\beta_i + \tau_k\right)\right)\right)}$$

This expression is the probability of person n scoring k or more on item i, where α_i is the discrimination parameter of item i, Θ_n is the ability parameter of person n, β_i is the location parameter of item i, and τ_k is the value of the k-th category boundary between categories k and k+1. The k-th category boundary, τ_k, is the point on the ability scale where responding in or above category k has probability equal to .5.

The Graded Response Model does not provide a simple general expression for the probability π_{nki} of person n responding in category k to item i. Instead, this probability is obtained by subtracting cumulative probabilities for all of the categories. In addition, the GRM does not allow for the algebraic separation of person and item parameters. Thus, no sufficient statistic can be derived for either person or item parameters in this model.

In the context of this study, the ability parameter for a given student is estimated based on the grades received in law school courses. For a specific course, the location parameter represents its relative difficulty among the courses at that law school, the discrimination parameter represents the increment in ability needed to obtain successively higher grades, and the category boundaries represent the relative distance among the different levels of grades. Simply stated, the GRM estimates each individual's ability based on all of the grades earned with each grade weighted by the actual frequency distribution of grades in each course. The same grade earned in a course with proportionately fewer high grades is considered more valuable than one earned in a course with a larger proportion of high grades, all other factors held constant. The estimated ability level from the GRM is a non-linear transformation of the actual GPA.

The Least-Squares GPA

The second method, based on GLM using classical least-squares techniques, is the most powerful of all statistical models (see e.g., Searle, 1971). When used to obtain a statistically adjusted GPA, the GLM takes the form of an incomplete design. Multiple measurements for each student (i.e., block) is available in the form of course grades. Each unique college course is considered the equivalent of a treatment. An estimate of the effect due to each course can be obtained and used to compute an adjusted cumulative GPA for each student. This method has certain advantages over the IRT-based method in that it generally requires less computing time, and also generates somewhat more stable estimates.

In computing the LS-GPA, an estimate of the effect due to each course is obtained and used to compute an adjusted cumulative GPA for each student. In this study, the GLM is an additive model with main effects only and has the following form:

$$GRADE_{ij} = \mu + \alpha_i + \beta_j + \epsilon_{ij},$$

where $GRADE_{ij}$ is the numerical value of the letter grade for the i-th student in the j-th course, μ is the grand mean of course grades, α_i is the 'effect' due to the i-th student, β_j is the 'effect' due to the j-th course, and ε_{ij} is the error term. Quotations are used around the word effect since this study does not satisfy the requirements for a true experimental study and no causal mechanism is postulated. Note that in this model, there is no interaction term, $(\alpha\beta)_{ij}$, since each student only takes each course once. Thus, estimation of this parameter is not possible since in this model it is absorbed into the error term.

The sample estimates of the parameters for the GLM are given by:

$$GRADE'_{ij} = \bar{X}_{..} + \hat{\alpha}_i + \hat{\beta}_j .$$

To compute an adjusted GPA for each student, we need an estimate of the average grading 'effect' due to each student. This estimate is given by the following expression:

$$\hat{\alpha}_i = (\sum_j (GRADE'_{ij} - \bar{X}_{..} - \hat{\beta}_j)) / j .$$

It should be noted that the students-by-courses data matrix in this study does not meet some of the assumptions for a randomized design. First, random assignment of students to courses is impossible for obvious reasons. In addition, the assumption of no student-by-course interactions may be violated since a student's grade may be determined by factors other than course performance, such as judicious course selection. Nevertheless, the advantage of this approach is that it enables us to develop a statistical procedure for adjusting a student's GPA. In contrast to the GRM, the GLM estimates each individual's ability based on all of the grades earned with each grade weighted by the mean of the grades in each course.

Methodology

The data for this study were obtained from the registrar's office of each law school and were made available in the form of a computer tape. The process for creation of this tape was essentially the same at all four institutions: Data on preadmission measures, LSAT scores and undergraduate GPA, were merged with law school course data and written to tape along with a pseudo student identification number (to preserve anonymity). For Schools C and D, undergraduate GPA was not obtainable.

The methods used to compute the adjusted GPAs were similar to those of previous studies. For the Least-Squares GPA, courses in which five or more students earned a letter grade were included. For each law school, the following number of courses was used to compute this index: School A, 142, School B, 169, School C, 173, and School D, 158. For the IRT-based GPA, the 50 courses at each institution with the highest number of enrolled students earning letter grades were used. As is true of earlier studies that used these methods, the number of courses was restricted due to the computation limitations of the statistical software.

For the IRT-based GPA, ordered categories of letter grades were used to estimate parameter values; for the LS-GPA, the letter grades were converted to their numerical equivalents using each institution's grading system. Non-letter grades such as Incomplete, No Credit, and Pass are excluded from the calculation of the IRT-based GPA, the LS-GPA, and the standard GPA. The data matrices used to calculate the adjusted GPAs are constructed as follows: the rows of each matrix represent students at a given law school while the columns represent courses taken by the cohort of students. The cells of each matrix contain the grade of a particular student in a specific course. If a student did not enroll in a course or did not receive a letter grade, a missing value was assumed for that cell of the matrix.

The data were checked for accuracy prior to usage and formatted for the various computer programs. Descriptive statistics were calculated for selected variables and predictive validity results are obtained in the standard manner by using multiple regression analysis to predict GPAs from the preadmissions measures. MULTILOG (Thissen, 1988) was the FORTRAN computer program used for estimating parameters of the Graded Response Model used to calculate the IRT-based GPA. PROC GLM in SAS (SAS Institute, Inc., 1985) was used for data management and to compute the Least-Squares GPA. All analyses were conducted using computer facilities available at Rutgers University.

Results

The results from this study are displayed in Tables 1-7 on the following pages with a discussion in the next section. Table 1 lists means and standard deviations for selected variables. Note that the grading system used at Schools B, C, and D is the traditional 4-point scale where an A is equivalent to a 4.0. In contrast, grades at School A range from a low of 50 to a high of 90. This difference in the grading systems has no impact on later results.

Table 1
Means and Standard Deviations of Variables

	School A	School B	School C	School D
N	157	191	188	206
LSAT	35.27 (4.72)	38.24 (4.68)	34.70 (4.76)	34.46 (6.44)
UGPA	3.40 (0.33)	3.22 (0.37)	---	---
LAWGPA	74.69 (3.26)	2.88 (0.33)	2.92 (0.45)	2.98 (0.45)

Note: UGPA = undergraduate GPA, LAWGPA = law school GPA.
Note: Entries are means with standard deviations underneath in parentheses.

Correlational and predictive validity results are displayed for School A in Tables 2 and 3; for School B in Tables 4 and 5; for School C in Table 6; and for School D in Table 7. Note that the sample sizes for these results is slightly different from that given in Table 1. This is due to missing data for a few cases for one or more of the variables in these analyses.

Table 2
Institution: School A (N = 152)

Matrix of Correlation Coefficients

	LSAT	UGPA	LAWGPA	LSGPA	IRTGPA
LSAT	1.00				
UGPA	.09	1.00			
LAWGPA	.41	.39	1.00		
LSGPA	.40	.40	.99	1.00	
IRTGPA	.41	.35	.97	.97	1.00

Table 3
Institution: School A (N = 152)

Prediction Equations Using Preadmission Measures

Dependent Variable: LAWGPA (Law School GPA)

Analysis of Variance Source Table

Source	df	SS	MS	F-ratio	R^2
Model	2	463.70	231.85	30.31	.2892
Error	149	1139.70	7.65		
Total	151	1603.40			

Multiple Regression Analysis Parameter Estimates

Variable	Estimate	Std Error	t-statistic	p <
intercept	53.6854	2.7697	19.38	.0001
LSAT	0.2568	0.0479	5.37	.0001
UGPA	3.5170	0.6870	5.12	.0001

Dependent Variable: LSGPA (Least-Squares GPA)

Analysis of Variance Source Table

Source	df	SS	MS	F-ratio	R^2
Model	2	488.43	244.22	31.43	.2967
Error	149	1157.69	7.77		
Total	151	1646.12			

Multiple Regression Analysis Parameter Estimates

Variable	Estimate	Std Error	t-statistic	p <
intercept	54.1946	2.7914	19.42	.0001
LSAT	0.2587	0.0482	5.36	.0001
UGPA	3.6803	0.6924	5.32	.0001

Dependent Variable: IRTGPA (Item Response Theory GPA)

Analysis of Variance Source Table

Source	df	SS	MS	F-ratio	R^2
Model	2	28.55	14.28	26.90	.2653
Error	149	79.08	0.53		
Total	151	107.63			

Multiple Regression Analysis Parameter Estimates

Variable	Estimate	Std Error	t-statistic	p <
intercept	-5.1511	0.7296	-7.06	.0001
LSAT	0.7962	0.1810	4.40	.0001
UGPA	0.0685	0.0126	5.44	.0001

Table 4
Institution: School B (N = 190)

Matrix of Correlation Coefficients

	LSAT	UGPA	LAWGPA	LSGPA	IRTGPA
LSAT	1.00				
UPGA	-.06	1.00			
LAWGPA	.46	.18	1.00		
LSGPA	.45	.19	.98	1.00	
IRTGPA	.46	.13	.91	.91	1.00

Table 5
Institution: School B (N = 190)

Prediction Equations Using Preadmission Measures

Dependent Variable: LAWGPA (Law School GPA)

Analysis of Variance Source Table

Source	df	SS	MS	F-ratio	R^2
Model	2	5.17	2.58	31.63	.2528
Error	187	15.27	0.08		
Total	189	20.44			

Multiple Regression Analysis Parameter Estimates

Variable	Estimate	Std Error	t-statistic	p <
intercept	1.0103	0.2578	3.92	.0001
LSAT	0.0330	0.0044	7.42	.0001
UGPA	0.1877	0.0566	3.32	.0001

Dependent Variable: LSGPA (Least-Squares GPA)

Analysis of Variance Source Table

Source	df	SS	MS	F-ratio	R^2
Model	2	5.88	5.88	31.34	.2511
Error	187	17.55	0.09		
Total	189	23.44			

Multiple Regression Analysis Parameter Estimates

Variable	Estimate	Std Error	t-statistic	p <
intercept	1.0141	0.2764	3.67	.0003
LSAT	0.0349	0.0048	7.32	.0001
UGPA	0.2115	0.0607	3.48	.0006

Dependent Variable: IRTGPA (Item Response Theory GPA)

Analysis of Variance Source Table

Source	df	SS	MS	F-ratio	R^2
Model	2	8.40	4.20	29.08	.2372
Error	187	27.01	0.14		
Total	189	35.41			

Multiple Regression Analysis Parameter Estimates

Variable	Estimate	Std Error	t-statistic	p <
intercept	-1.6384	0.3429	-4.78	.0001
LSAT	0.0434	0.0059	7.33	.0001
UGPA	0.1919	0.0752	2.55	.0116

Table 6
Institution: School C (N = 178)

Matrix of Correlation Coefficients

	LSAT	LAWGPA	LSGPA	IRTGPA
LSAT	1.00			
LAWGPA	.43	1.00		
LSGPA	.42	.99	1.00	
IRTGPA	.34	.90	.89	1.00

Prediction Equations Using Preadmission Measures

Dependent Variable: LAWGPA (Law School GPA)

Analysis of Variance Source Table

Source	df	SS	MS	F-ratio	R^2
Model	1	6.70	6.70	39.38	.1828
Error	176	29.98	0.17		
Total	177	36.69			

Multiple Regression Analysis Parameter Estimates

Variable	Estimate	Std Error	t-statistic	p <
intercept	1.5078	0.2284	6.60	.0001
LSAT	0.0409	0.0065	6.28	.0001

Dependent Variable: LSGPA (Least-Squares GPA)

Analysis of Variance Source Table

Source	df	SS	MS	F-ratio	R^2
Model	1	6.73	6.73	38.13	.1781
Error	176	31.09	0.18		
Total	177	37.82			

Multiple Regression Analysis Parameter Estimates

Variable	Estimate	Std Error	t-statistic	p <
intercept	1.6105	0.2326	6.92	.0001
LSAT	0.0410	0.0066	6.18	.0001

Dependent Variable: IRTGPA (Item Response Theory GPA)

Analysis of Variance Source Table

Source	df	SS	MS	F-ratio	R^2
Model	1	3.14	3.14	22.87	.1150
Error	176	24.16	0.14		
Total	177	27.30			

Multiple Regression Analysis Parameter Estimates

Variable	Estimate	Std Error	t-statistic	p <
intercept	-1.0748	0.2051	-5.24	.0001
LSAT	0.0280	0.0059	4.78	.0001

Table 7
Institution: School D (N = 181)

Matrix of Correlation Coefficients

	LSAT	LAWGPA	LSGPA	IRTGPA
LSAT	1.00			
LAWGPA	.63	1.00		
LSGPA	.67	.99	1.00	
IRTGPA	.65	.92	.91	1.00

Prediction Equations Using Preadmission Measures

Dependent Variable: LAWGPA (Law School GPA)

Analysis of Variance Source Table

Source	df	SS	MS	F-ratio	R^2
Model	1	14.42	14.42	119.78	.4009
Error	179	21.55	0.12		
Total	180	35.98			

Multiple Regression Analysis Parameter Estimates

Variable	Estimate	Std Error	t-statistic	p <
intercept	1.4672	0.1407	10.43	.0001
LSAT	0.0440	0.0040	10.94	.0001

Dependent Variable: LSGPA (Least-Squares GPA)

Analysis of Variance Source Table

Source	df	SS	MS	F-ratio	R^2
Model	1	17.21	17.21	147.17	.4512
Error	179	20.93	0.12		
Total	181	38.14			

Multiple Regression Analysis Parameter Estimates

Variable	Estimate	Std Error	t-statistic	p <
intercept	1.4434	0.1387	10.41	.0001
LSAT	0.0481	0.0040	12.13	.0001

Dependent Variable: IRTGPA (Item Response Theory GPA)

Analysis of Variance Source Table

Source	df	SS	MS	F-ratio	R^2
Model	1	26.28	26.28	129.33	.4194
Error	179	36.38	0.20		
Total	180	62.66			

Multiple Regression Analysis Parameter Estimates

Variable	Estimate	Std Error	t-statistic	p <
intercept	-2.5477	0.1828	-13.94	.0001
LSAT	0.0594	0.0052	11.37	.0001

Descriptive Statistics

The average of LSAT scores for the cohorts from Schools A, C, and D are quite similar, around 35, while the average for School B is significantly higher at 38.24 ($p < .05$). The variation in scores, as measured by the standard deviation, is around 4.7 for Schools A, B, and C while School D has greater variability in scores with a standard deviation of 6.44 ($p < .05$). It is likely that the greater variation of scores at School D leads to a higher correlation of LSAT scores with law school grades than is true for the other institutions. This point is further elaborated in the discussion section.

Results of Adjusting Grades

Representative results from adjusting grades via IRT and GLM, for School D, are given in the appendices at the end of this report. Grade adjustment via IRT yielded a measure of law school performance for each student, labeled THETAHAT on the printout, that is standardized within each institution to have a normal distribution with a mean of zero and a variance of one (see appendix A). Although this scale differs from the grade scales used by the law schools, this difference has no effect on the correlational or predictive validity results. Only IRT results for individuals are presented since comparison among courses is not central to this study. In contrast, the adjustment via GLM yielded the LS-GPA which is standardized to have the same mean and variance as the actual distribution of GPAs at each law school (see appendix B). Values for grades in appendix B are those reported on the institution's computer tape; actual grades are these values divided by ten (this computation does not impact correlational or predictive validity results).

Correlational and Predictive Validity Results

In general, the effects of adjusting law school GPA (LAWGPA) via IRT is greater than using Least-Squares. This is evident by comparing the correlations of LAWGPA with IRTGPA (range: .90 - .97) and LAWGPA with LS-GPA (range: .98 - .99). Neither adjustment method, however, yields consistently higher correlations of grades with LSAT scores. The unweighted average correlation of LSAT scores with LAWGPA is .48 (range: .41 - .63); of LSAT scores with IRTGPA is .47 (range: .34 - .65); and of LSAT scores with LS-GPA is .49 (range: .40 - .67). The largest impact due to adjusting grades occurs at School D where the correlation of LSAT scores with LAWGPA is .63 but is significantly higher with LS-GPA at .67 ($p < .001$).

The effects of adjusting law school grades in terms of their correlation with undergraduate grades is mixed. For the two institutions for which undergraduate GPAs were available, Schools A and B, the IRT method yields a lower correlation while the Least-Squares approach yields a minimal increase in correlation. At both institutions, LSAT scores have a significantly higher correlation with LAWGPA, IRTGPA, and LS-GPA when compared with undergraduate GPA. Since both undergraduate grades and LSAT scores were available for Schools A and B, an analysis of the multiple correlation of these preadmission measures with grades is possible. These values range from a low of .49 with IRTGPA at School B to a high of .54 for LS-GPA and LAWGPA at School A which are generally similar to predictive validity results from studies conducted at other law schools (see e.g., Linn & Hastings, 1984).

An interpretation of the results of this study is provided in the next section.

Discussion

In general, the two grade adjustment methods applied to these data appear to yield relatively minor improvements in the predictive validity of LSAT scores in forecasting law school academic performance with one exception: the use of the Least-Squares approach significantly raised the correlation of LSAT scores from .63 to .67 at School D. The most plausible explanation for the apparent lack of improvement is the high commonality of the courses taken by these students. Since the students at each law school enrolled in essentially the same courses, any adjustment method based on course differences will likely have little impact in changing the relative rankings of students. In contrast, undergraduates generally have greater latitude in choosing courses and majors, thus the apparent improvement from use of these methods is substantially greater.

The significant improvement found for LS-GPA at School D is most likely due to the fact that the variation in LSAT scores is significantly greater than at the other institutions. A comparison of the variance (the square of the standard deviation) of test scores shows that School D has at least 83% greater variance in scores than at any of the other law schools. In other words, the smaller variance of LSAT scores at Schools A, B, and C means that the likely restriction of range in these scores leads to decreased correlations with other variables.

Finally, it also appears that of the two methods, the Least-Squares approach was generally better for these data and yielded results that were expected and in the right direction. The Least-Squares approach is conceptually simpler and computationally less demanding to implement, reasons that may have led to the results found here.

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Appendix A

MULTILOG

FOR MULTIPLE CATEGORICAL ITEM RESPONSE DATA

VERSION 5.11

LSAT Study - School D

DATA PARAMETERS

N	L	L1	L2	NCHAR	MCODE
206	51	50	1	4	9

ESTIMATION PARAMETERS-

NCYC	NFRC	NSEG	NP	MAXIT
100	0	1	0	10

I/O CONTROLS

LOTS	I1	I2	RESTRT
0	1	2	0

CONVERGENCE CONTROL-

CRTI	CRTC	STEP	RK	RM	ACCMAX
.001	.0010	.5000	.9000	1.0000	.0000

MISSING VALUE CODE FOR CONTINUOUS DATA= 9.0000

SWITCHES-

PUNI	PUNS	PRNTS	READI	READS	FIT	SCORE	KMID	SDIZE	READC
F	F	T	T	T	F	T	F	F	F

MARG	RWT	INCORE	PRIOR
F	F	F	F

ITEM SUMMARY AT START

SCHOOL D

ITEM 1 9 GRADED CATEGORIES

A = P(1) = 1.000
B(1) = P(2) = -2.080
B(2) = P(3) = -1.250
B(3) = P(4) = -.693
B(4) = P(5) = -.223
B(5) = P(6) = .223
B(6) = P(7) = .693
B(7) = P(8) = 1.250
B(8) = P(9) = 2.080

ITEM 2 9 GRADED CATEGORIES

A = P(10) = 1.000
B(1) = P(11) = -2.080
B(2) = P(12) = -1.250
B(3) = P(13) = -.693
B(4) = P(14) = -.223
B(5) = P(15) = .223
B(6) = P(16) = .693
B(7) = P(17) = 1.250
B(8) = P(18) = 2.080

ITEM 3 9 GRADED CATEGORIES

A = P(19) = 1.000
B(1) = P(20) = -2.080
B(2) = P(21) = -1.250
B(3) = P(22) = -.693
B(4) = P(23) = -.223
B(5) = P(24) = .223
B(6) = P(25) = .693
B(7) = P(26) = 1.250
B(8) = P(27) = 2.080

ITEM 4 9 GRADED CATEGORIES

A = P(28) = 1.000
B(1) = P(29) = -2.080
B(2) = P(30) = -1.250
B(3) = P(31) = -.693
B(4) = P(32) = -.223
B(5) = P(33) = .223
B(6) = P(34) = .693
B(7) = P(35) = 1.250
B(8) = P(36) = 2.080

ITEM 5 9 GRADED CATEGORIES

A = P(37) = 1.000
B(1) = P(38) = -2.080
B(2) = P(39) = -1.250
B(3) = P(40) = -.693
B(4) = P(41) = -.223
B(5) = P(42) = .223
B(6) = P(43) = .693
B(7) = P(44) = 1.250
B(8) = P(45) = 2.080

ITEM 6 9 GRADED CATEGORIES

A = P(46) = 1.000
B(1) = P(47) = -2.080
B(2) = P(48) = -1.250
B(3) = P(49) = -.693
B(4) = P(50) = -.223
B(5) = P(51) = .223
B(6) = P(52) = .693
B(7) = P(53) = 1.250
B(8) = P(54) = 2.080

ITEM 7 9 GRADED CATEGORIES

A = P(55) = 1.000
B(1) = P(56) = -2.080
B(2) = P(57) = -1.250
B(3) = P(58) = -.693
B(4) = P(59) = -.223
B(5) = P(60) = .223
B(6) = P(61) = .693
B(7) = P(62) = 1.250
B(8) = P(63) = 2.080

ITEM 8 9 GRADED CATEGORIES

A = P(64) = 1.000
B(1) = P(65) = -2.080
B(2) = P(66) = -1.250
B(3) = P(67) = -.693
B(4) = P(68) = -.223
B(5) = P(69) = .223
B(6) = P(70) = .693
B(7) = P(71) = 1.250
B(8) = P(72) = 2.080

ITEM 9 9 GRADED CATEGORIES

A = P(73) = 1.000
B(1) = P(74) = -2.080
B(2) = P(75) = -1.250
B(3) = P(76) = -.693
B(4) = P(77) = -.223
B(5) = P(78) = .223
B(6) = P(79) = .693
B(7) = P(80) = 1.250
B(8) = P(81) = 2.080

ITEM 10 9 GRADED CATEGORIES

A = P(82) = 1.000
B(1) = P(83) = -2.080
B(2) = P(84) = -1.250
B(3) = P(85) = -.693
B(4) = P(86) = -.223
B(5) = P(87) = .223
B(6) = P(88) = .693
B(7) = P(89) = 1.250
B(8) = P(90) = 2.080

ITEM 11 9 GRADED CATEGORIES

A = P(91) = 1.000
B(1) = P(92) = -2.080
B(2) = P(93) = -1.250
B(3) = P(94) = -.693
B(4) = P(95) = -.223
B(5) = P(96) = .223
B(6) = P(97) = .693
B(7) = P(98) = 1.250
B(8) = P(99) = 2.080

ITEM 12 9 GRADED CATEGORIES

A = P(100) = 1.000
B(1) = P(101) = -2.080
B(2) = P(102) = -1.250
B(3) = P(103) = -.693
B(4) = P(104) = -.223
B(5) = P(105) = .223
B(6) = P(106) = .693
B(7) = P(107) = 1.250
B(8) = P(108) = 2.080

ITEM 13 9 GRADED CATEGORIES

A = P(109) = 1.000
B(1) = P(110) = -2.080
B(2) = P(111) = -1.250
B(3) = P(112) = -.693
B(4) = P(113) = -.223
B(5) = P(114) = .223
B(6) = P(115) = .693
B(7) = P(116) = 1.250
B(8) = P(117) = 2.080

ITEM 14 9 GRADED CATEGORIES

A = P(118) = 1.000
B(1) = P(119) = -2.080
B(2) = P(120) = -1.250
B(3) = P(121) = -.693
B(4) = P(122) = -.223
B(5) = P(123) = .223
B(6) = P(124) = .693
B(7) = P(125) = 1.250
B(8) = P(126) = 2.080

ITEM 15 9 GRADED CATEGORIES

A = P(127) = 1.000
B(1) = P(128) = -2.080
B(2) = P(129) = -1.250
B(3) = P(130) = -.693
B(4) = P(131) = -.223
B(5) = P(132) = .223
B(6) = P(133) = .693
B(7) = P(134) = 1.250
B(8) = P(135) = 2.080

ITEM 16 9 GRADED CATEGORIES

A = P(136) = 1.000
B(1) = P(137) = -2.080
B(2) = P(138) = -1.250
B(3) = P(139) = -.693
B(4) = P(140) = -.223
B(5) = P(141) = .223
B(6) = P(142) = .693
B(7) = P(143) = 1.250
B(8) = P(144) = 2.080

ITEM 17 9 GRADED CATEGORIES

A = P(145) = 1.000
B(1) = P(146) = -2.080
B(2) = P(147) = -1.250
B(3) = P(148) = -.693
B(4) = P(149) = -.223
B(5) = P(150) = .223
B(6) = P(151) = .693
B(7) = P(152) = 1.250
B(8) = P(153) = 2.080

ITEM 18 9 GRADED CATEGORIES

A = P(154) = 1.000
B(1) = P(155) = -2.080
B(2) = P(156) = -1.250
B(3) = P(157) = -.693
B(4) = P(158) = -.223
B(5) = P(159) = .223
B(6) = P(160) = .693
B(7) = P(161) = 1.250
B(8) = P(162) = 2.080

ITEM 19 9 GRADED CATEGORIES

A = P(163) = 1.000
B(1) = P(164) = -2.080
B(2) = P(165) = -1.250
B(3) = P(166) = -.693
B(4) = P(167) = -.223
B(5) = P(168) = .223
B(6) = P(169) = .693
B(7) = P(170) = 1.250
B(8) = P(171) = 2.080

ITEM 20 9 GRADED CATEGORIES

A = P(172) = 1.000
B(1) = P(173) = -2.080
B(2) = P(174) = -1.250
B(3) = P(175) = -.693
B(4) = P(176) = -.223
B(5) = P(177) = .223
B(6) = P(178) = .693
B(7) = P(179) = 1.250
B(8) = P(180) = 2.080

ITEM 21 9 GRADED CATEGORIES

A = P(181) = 1.000
B(1) = P(182) = -2.080
B(2) = P(183) = -1.250
B(3) = P(184) = -.693
B(4) = P(185) = -.223
B(5) = P(186) = .223
B(6) = P(187) = .693
B(7) = P(188) = 1.250
B(8) = P(189) = 2.080

ITEM 22 9 GRADED CATEGORIES

A = P(190) = 1.000
B(1) = P(191) = -2.080
B(2) = P(192) = -1.250
B(3) = P(193) = -.693
B(4) = P(194) = -.223
B(5) = P(195) = .223
B(6) = P(196) = .693
B(7) = P(197) = 1.250
B(8) = P(198) = 2.080

ITEM 23 9 GRADED CATEGORIES

A = P(199) = 1.000
B(1) = P(200) = -2.080
B(2) = P(201) = -1.250
B(3) = P(202) = -.693
B(4) = P(203) = -.223
B(5) = P(204) = .223
B(6) = P(205) = .693
B(7) = P(206) = 1.250
B(8) = P(207) = 2.080

ITEM 24 9 GRADED CATEGORIES

A = P(208) = 1.000
B(1) = P(209) = -2.080
B(2) = P(210) = -1.250
B(3) = P(211) = -.693
B(4) = P(212) = -.223
B(5) = P(213) = .223
B(6) = P(214) = .693
B(7) = P(215) = 1.250
B(8) = P(216) = 2.080

ITEM 25 9 GRADED CATEGORIES

A = P(217) = 1.000
B(1) = P(218) = -2.080
B(2) = P(219) = -1.250
B(3) = P(220) = -.693
B(4) = P(221) = -.223
B(5) = P(222) = .223
B(6) = P(223) = .693
B(7) = P(224) = 1.250
B(8) = P(225) = 2.080

ITEM 26 9 GRADED CATEGORIES

A = P(226) = 1.000
B(1) = P(227) = -2.080
B(2) = P(228) = -1.250
B(3) = P(229) = -.693
B(4) = P(230) = -.223
B(5) = P(231) = .223
B(6) = P(232) = .693
B(7) = P(233) = 1.250
B(8) = P(234) = 2.080

ITEM 27 9 GRADED CATEGORIES

A = P(235) = 1.000
B(1) = P(236) = -2.080
B(2) = P(237) = -1.250
B(3) = P(238) = -.693
B(4) = P(239) = -.223
B(5) = P(240) = .223
B(6) = P(241) = .693
B(7) = P(242) = 1.250
B(8) = P(243) = 2.080

ITEM 28 9 GRADED CATEGORIES

A = P(244) = 1.000
B(1) = P(245) = -2.080
B(2) = P(246) = -1.250
B(3) = P(247) = -.693
B(4) = P(248) = -.223
B(5) = P(249) = .223
B(6) = P(250) = .693
B(7) = P(251) = 1.250
B(8) = P(252) = 2.080

ITEM 29 9 GRADED CATEGORIES

A = P(253) = 1.000
B(1) = P(254) = -2.080
B(2) = P(255) = -1.250
B(3) = P(256) = -.693
B(4) = P(257) = -.223
B(5) = P(258) = .223
B(6) = P(259) = .693
B(7) = P(260) = 1.250
B(8) = P(261) = 2.080

ITEM 30 9 GRADED CATEGORIES

A = P(262) = 1.000
B(1) = P(263) = -2.080
B(2) = P(264) = -1.250
B(3) = P(265) = -.693
B(4) = P(266) = -.223
B(5) = P(267) = .223
B(6) = P(268) = .693
B(7) = P(269) = 1.250
B(8) = P(270) = 2.080

ITEM 31 9 GRADED CATEGORIES

A = P(271) = 1.000
B(1) = P(272) = -2.080
B(2) = P(273) = -1.250
B(3) = P(274) = -.693
B(4) = P(275) = -.223
B(5) = P(276) = .223
B(6) = P(277) = .693
B(7) = P(278) = 1.250
B(8) = P(279) = 2.080

ITEM 32 9 GRADED CATEGORIES

A = P(280) = 1.000
B(1) = P(281) = -2.080
B(2) = P(282) = -1.250
B(3) = P(283) = -.693
B(4) = P(284) = -.223
B(5) = P(285) = .223
B(6) = P(286) = .693
B(7) = P(287) = 1.250
B(8) = P(288) = 2.080

ITEM 33 9 GRADED CATEGORIES

A = P(289) = 1.000
B(1) = P(290) = -2.080
B(2) = P(291) = -1.250
B(3) = P(292) = -.693
B(4) = P(293) = -.223
B(5) = P(294) = .223
B(6) = P(295) = .693
B(7) = P(296) = 1.250
B(8) = P(297) = 2.080

ITEM 34 9 GRADED CATEGORIES

A = P(298) = 1.000
B(1) = P(299) = -2.080
B(2) = P(300) = -1.250
B(3) = P(301) = -.693
B(4) = P(302) = -.223
B(5) = P(303) = .223
B(6) = P(304) = .693
B(7) = P(305) = 1.250
B(8) = P(306) = 2.080

ITEM 35 9 GRADED CATEGORIES

A = P(307) = 1.000
B(1) = P(308) = -2.080
B(2) = P(309) = -1.250
B(3) = P(310) = -.693
B(4) = P(311) = -.223
B(5) = P(312) = .223
B(6) = P(313) = .693
B(7) = P(314) = 1.250
B(8) = P(315) = 2.080

ITEM 36 9 GRADED CATEGORIES

A = P(316) = 1.000
B(1) = P(317) = -2.080
B(2) = P(318) = -1.250
B(3) = P(319) = -.693
B(4) = P(320) = -.223
B(5) = P(321) = .223
B(6) = P(322) = .693
B(7) = P(323) = 1.250
B(8) = P(324) = 2.080

ITEM 37 9 GRADED CATEGORIES

A = P(325) = 1.000
B(1) = P(326) = -2.080
B(2) = P(327) = -1.250
B(3) = P(328) = -.693
B(4) = P(329) = -.223
B(5) = P(330) = .223
B(6) = P(331) = .693
B(7) = P(332) = 1.250
B(8) = P(333) = 2.080

ITEM 38 9 GRADED CATEGORIES

A = P(334) = 1.000
B(1) = P(335) = -2.080
B(2) = P(336) = -1.250
B(3) = P(337) = -.693
B(4) = P(338) = -.223
B(5) = P(339) = .223
B(6) = P(340) = .693
B(7) = P(341) = 1.250
B(8) = P(342) = 2.080

ITEM 39 9 GRADED CATEGORIES

A = P(343) = 1.000
B(1) = P(344) = -2.080
B(2) = P(345) = -1.250
B(3) = P(346) = -.693
B(4) = P(347) = -.223
B(5) = P(348) = .223
B(6) = P(349) = .693
B(7) = P(350) = 1.250
B(8) = P(351) = 2.080

ITEM 40 9 GRADED CATEGORIES

A = P(352) = 1.000
B(1) = P(353) = -2.080
B(2) = P(354) = -1.250
B(3) = P(355) = -.693
B(4) = P(356) = -.223
B(5) = P(357) = .223
B(6) = P(358) = .693
B(7) = P(359) = 1.250
B(8) = P(360) = 2.080

ITEM 41 9 GRADED CATEGORIES

A = P(361) = 1.000
B(1) = P(362) = -2.080
B(2) = P(363) = -1.250
B(3) = P(364) = -.693
B(4) = P(365) = -.223
B(5) = P(366) = .223
B(6) = P(367) = .693
B(7) = P(368) = 1.250
B(8) = P(369) = 2.080

ITEM 42 9 GRADED CATEGORIES

A = P(370) = 1.000
B(1) = P(371) = -2.080
B(2) = P(372) = -1.250
B(3) = P(373) = -.693
B(4) = P(374) = -.223
B(5) = P(375) = .223
B(6) = P(376) = .693
B(7) = P(377) = 1.250
B(8) = P(378) = 2.080

ITEM 43 9 GRADED CATEGORIES

A = P(379) = 1.000
B(1) = P(380) = -2.080
B(2) = P(381) = -1.250
B(3) = P(382) = -.693
B(4) = P(383) = -.223
B(5) = P(384) = .223
B(6) = P(385) = .693
B(7) = P(386) = 1.250
B(8) = P(387) = 2.080

ITEM 44 9 GRADED CATEGORIES

A = P(388) = 1.000
B(1) = P(389) = -2.080
B(2) = P(390) = -1.250
B(3) = P(391) = -.693
B(4) = P(392) = -.223
B(5) = P(393) = .223
B(6) = P(394) = .693
B(7) = P(395) = 1.250
B(8) = P(396) = 2.080

ITEM 45 9 GRADED CATEGORIES

A = P(397) = 1.000
B(1) = P(398) = -2.080
B(2) = P(399) = -1.250
B(3) = P(400) = -.693
B(4) = P(401) = -.223
B(5) = P(402) = .223
B(6) = P(403) = .693
B(7) = P(404) = 1.250
B(8) = P(405) = 2.080

ITEM 46 9 GRADED CATEGORIES

A = P(406) = 1.000
B(1) = P(407) = -2.080
B(2) = P(408) = -1.250
B(3) = P(409) = -.693
B(4) = P(410) = -.223
B(5) = P(411) = .223
B(6) = P(412) = .693
B(7) = P(413) = 1.250
B(8) = P(414) = 2.080

ITEM 47 9 GRADED CATEGORIES

A = P(415) = 1.000
B(1) = P(416) = -2.080
B(2) = P(417) = -1.250
B(3) = P(418) = -.693
B(4) = P(419) = -.223
B(5) = P(420) = .223
B(6) = P(421) = .693
B(7) = P(422) = 1.250
B(8) = P(423) = 2.080

ITEM 48 9 GRADED CATEGORIES

A = P(424) = 1.000
B(1) = P(425) = -2.080
B(2) = P(426) = -1.250
B(3) = P(427) = -.693
B(4) = P(428) = -.223
B(5) = P(429) = .223
B(6) = P(430) = .693
B(7) = P(431) = 1.250
B(8) = P(432) = 2.080

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ITEM  49     9 GRADED CATEGORIES

A = P(433) =   1.000
 B( 1) = P(434) =  -2.080
 B( 2) = P(435) =  -1.250
 B( 3) = P(436) =   -.693
 B( 4) = P(437) =   -.223
 B( 5) = P(438) =    .223
 B( 6) = P(439) =    .693
 B( 7) = P(440) =   1.250
 B( 8) = P(441) =   2.080

ITEM  50     9 GRADED CATEGORIES

A = P(442) =   1.000
 B( 1) = P(443) =  -2.080
 B( 2) = P(444) =  -1.250
 B( 3) = P(445) =   -.693
 B( 4) = P(446) =   -.223
 B( 5) = P(447) =    .223
 B( 6) = P(448) =    .693
 B( 7) = P(449) =   1.250
 B( 8) = P(450) =   2.080


ITEM  51 GRP1 GAUSSIAN CONTINUOUS-

BETA = P(499) =  -1.000, MU = P(451) = .000, SIGMA = P(498) = 1.000

IN-CORE CATEGORICAL DATA STORAGE AVAILABLE FOR N = 500,  5000 WORDS.

SCHOOL D

READING DATA...
KEY-
CODE  CATEGORY

  0     000000000000000000000000000000000000000000000000
  1     111111111111111111111111111111111111111111111111
  2     222222222222222222222222222222222222222222222222
  3     333333333333333333333333333333333333333333333333
  4     444444444444444444444444444444444444444444444444
  5     555555555555555555555555555555555555555555555555
  6     666666666666666666666666666666666666666666666666
  7     777777777777777777777777777777777777777777777777
  8     888888888888888888888888888888888888888888888888

FORMAT FOR DATA-
 (4A1,1X,48A1,T5,F1.0)

FIRST OBSERVATION AS READ-
 ID      1
 ITEMS 346330452099999999929949999992979999999999939999
 NORML        .000
```

SCORING DATA...
SCHOOL D

THETAHAT	S.E.	ITER	ID FIELD	THETAHAT	S.E.	ITER	ID FIELD	THETAHAT	S.E.	ITER	ID FIELD
-.586	.389	5	1	-.115	.360	2	70	.273	.368	4	139
-.687	.608	5	2	.000	1.000	1	71	-.331	.459	4	140
.400	.370	4	3	-.056	.354	2	72	.275	.391	4	141
-.698	.456	4	4	-.638	.422	4	73	-.204	.363	2	142
-.880	.391	4	5	-.133	.774	2	74	.319	.378	4	143
.037	.408	2	6	.579	.365	4	75	-.894	.428	3	144
-.635	.390	3	7	-1.861	.438	4	76	-1.295	.410	4	145
.192	.464	4	8	-.813	.363	3	77	-.217	.443	2	146
.307	.390	4	9	.000	1.000	1	78	-.325	.382	4	147
-1.010	.492	3	10	.502	.342	3	79	-.094	.376	3	148
-1.350	.834	6	11	.166	.387	4	80	-.601	.383	4	149
.336	.369	4	12	-1.891	.435	3	81	.000	1.000	1	150
-1.258	.554	4	13	.116	.323	4	82	-.717	.399	4	151
-.295	.436	3	14	.481	.366	4	83	.302	.366	4	152
-.613	.366	5	15	-1.034	.783	3	84	-1.064	.379	4	153
-1.483	.502	5	16	-.751	.472	4	85	.031	.375	2	154
-.682	.378	4	17	-.533	.363	4	86	-.970	.642	4	155
-1.255	.506	4	18	-2.096	.509	3	87	-.570	.398	4	156
-.431	.346	4	19	-.175	.443	4	88	-.602	.617	2	157
-.606	.438	4	20	-.660	.342	4	89	.000	1.000	1	158
-.725	.427	3	21	.093	.374	2	90	-1.091	.530	5	159
-1.185	.511	3	22	.081	.426	2	91	.729	.353	5	160
.000	1.000	1	23	-.717	.357	4	92	-.276	.352	3	161
.079	.345	2	24	-.140	.397	2	93	.000	1.000	1	162
-.352	.422	4	25	-.958	.471	5	94	-.603	.376	4	163
.189	.348	4	26	-.402	.346	4	95	.000	1.000	1	164
-2.034	.524	4	27	-.614	.415	4	96	-.408	.407	4	165
-.526	.409	4	28	-.245	.332	4	97	.000	.351	1	166
-.478	.462	4	29	-1.023	.488	4	98	.158	.344	4	167
-.094	.375	2	30	.220	.444	4	99	-1.351	.410	3	168
.000	1.000	1	31	-1.005	.385	4	100	-.840	.776	3	169
-.906	.340	5	32	.838	.364	5	101	.000	1.000	1	170
.181	.369	4	33	-.238	.367	2	102	-.094	.374	4	171
-.770	.620	2	34	-.750	.359	4	103	-.507	.344	4	172
-1.466	.499	3	35	.411	.376	4	104	-.038	.410	4	173
-.833	.419	3	36	-.425	.693	4	105	-.376	.360	4	174
-.914	.624	4	37	.148	.365	4	106	-.417	.395	4	175
-1.240	.462	5	38	-.198	.385	4	107	-.142	.357	4	176
.196	.354	4	39	.105	.344	4	108	-.546	.390	4	177
-1.120	.388	4	40	-.089	.447	3	109	-.650	.372	3	178
-.952	.418	4	41	-.313	.832	4	110	-1.706	.429	4	179
-1.539	.425	3	42	.000	1.000	1	111	.369	.356	4	180
.705	.357	5	43	-.222	.408	2	112	-.763	.358	5	181
-.726	.379	4	44	-.381	.376	4	113	-.899	.668	4	182
-1.428	.721	3	45	-.770	.536	3	114	-.647	.376	5	183
-.756	.457	4	46	-1.057	.391	3	115	-.227	.712	4	184
-.700	.404	4	47	-.223	.354	4	116	-.000	.468	4	185
-1.261	.411	5	48	.000	1.000	1	117	-1.396	.414	5	186
-1.758	.410	5	49	.098	.384	4	118	.000	1.000	1	187
-1.110	.410	5	50	-1.129	.401	5	119	.233	.722	4	188
-.314	.375	4	51	-1.071	.431	3	120	-.653	.599	4	189
.353	.347	4	52	-1.128	.462	3	121	-.066	.385	4	190
.137	.392	4	53	-.211	.368	4	122	.000	1.000	1	191
-.468	.401	4	54	.000	1.000	1	123	-.740	.378	4	192
.029	.360	2	55	.217	.402	4	124	-.518	.368	3	193
-1.149	.432	5	56	-.971	.408	4	125	-.511	.376	3	194
-.615	.360	4	57	.000	1.000	1	126	-1.128	.445	4	195
.084	.355	2	58	-.196	.356	3	127	-.952	.578	4	196
-1.670	.456	3	59	.340	.467	4	128	-1.333	.479	3	197
-.582	.532	5	60	-.828	.373	3	129	-.063	.377	2	198
.000	.545	1	61	-.495	.522	4	130	.468	.384	4	199
-.276	.455	2	62	-.716	.371	4	131	-1.014	.422	3	200
-.136	.349	2	63	.100	.388	4	132	-.968	.385	4	201
-.217	.443	2	64	-.399	.334	4	133	-.665	.457	4	202
-1.560	.383	4	65	.027	.348	2	134	-.834	.633	4	203
-.143	.359	2	66	-.764	.388	5	135	-.349	.417	4	204
-.293	.362	4	67	-1.512	.458	3	136	-.346	.359	4	205
-.983	.385	3	68	.000	1.000	1	137	.000	1.000	1	206
.157	.420	4	69	-.357	.350	4	138	DATA ARE ON FILE 2			

BEST COPY AVAILABLE

Appendix B

```
1          SAS(R) LOG    OS SAS 5.18          VS2/MVS JOB NEWARK    STEP SAS                                      14:13 MONDAY, JUNE 10, 1991

NOTE: COPYRIGHT (C) 1984,1988 SAS INSTITUTE INC., CARY, N.C.  27512, U.S.A.
NOTE: THE JOB NEWARK HAS BEEN RUN UNDER RELEASE 5.18 OF SAS AT RUTGERS UNIVERSITY- CCIS (01449001).

NOTE: CPUID   VERSION = FF  SERIAL = 024071  MODEL = 3081 .
      CPUID   VERSION = FF  SERIAL = 024071  MODEL = 3081 .

NOTE: SAS OPTIONS SPECIFIED ARE:
       SORT=4 LEAVE=24K

1            TITLE1 '                  LAW SCHOOL DATA';
2            TITLE2 'GENERAL LINEAR MODEL STUDY';
3            TITLE3 'ALL STUDENTS, MINIMUM COURSE SIZE = 5';
4            OPTIONS LINESIZE=80;
5            DATA WORK1;
6            INFILE FILE2;
7            INPUT ID 1-6;
8            DO COURSE=1 TO 158;
9               INPUT (GRADE) (2.) @;
10              IF GRADE EQ 0 THEN GRADE=.;
11              OUTPUT;
12           END;


NOTE: INFILE FILE2 IS:
      DSNAME=WYL.A2543.S001.SCHOOL23.MATRIX,
      UNIT=DISK,VOL=SER=WYL801,DISP=SHR,
      DCB=(BLKSIZE=4000,LRECL=80,RECFM=FB)

NOTE: SAS WENT TO A NEW LINE WHEN INPUT STATEMENT
      REACHED PAST THE END OF A LINE.
NOTE: 1030 LINES WERE READ FROM INFILE FILE2.
NOTE: DATA SET WORK.WORK1 HAS 32548 OBSERVATIONS AND 3 VARIABLES. 1676 OBS/TRK.
NOTE: THE DATA STATEMENT USED 1.30 SECONDS AND 196K.

13           PROC GLM;
14           CLASS ID COURSE;
15           MODEL GRADE=ID COURSE;
16           MEANS ID COURSE;
17           LSMEANS ID COURSE / STDERR;
NOTE: THE PROCEDURE GLM USED 188.97 SECONDS AND 420K
      AND PRINTED PAGES 1 TO 18.
NOTE: SAS USED 420K MEMORY.

NOTE: SAS INSTITUTE INC.
      SAS CIRCLE
      PO BOX 8000
      CARY, N.C. 27512-8000
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LAW SCHOOL DATA
GENERAL LINEAR MODEL STUDY
ALL STUDENTS, MINIMUM COURSE SIZE = 5
14:13 MONDAY, JUNE 10, 1991

GENERAL LINEAR MODELS PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
ID	206	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206
COURSE	158	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158

NUMBER OF OBSERVATIONS IN DATA SET = 32548

NOTE: ALL DEPENDENT VARIABLES ARE CONSISTENT WITH RESPECT TO THE PRESENCE OR ABSENCE OF MISSING VALUES. HOWEVER, ONLY 3517 OBSERVATIONS CAN BE USED IN THIS ANALYSIS.

LAW SCHOOL DATA
GENERAL LINEAR MODEL STUDY
ALL STUDENTS, MINIMUM COURSE SIZE = 5
14:13 MONDAY, JUNE 10, 1991
GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: GRADE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	345	97584.57348241	282.85383618	10.77
ERROR	3171	83242.59114653	26.25121134	PR > F
CORRECTED TOTAL	3516	180827.16462895		0.0

R-SQUARE	C.V.	ROOT MSE	GRADE MEAN
0.539657	16.9912	5.12359360	30.15439295

SOURCE	DF	TYPE I SS	F VALUE	PR > F
ID	188	62846.00198850	12.73	0.0
COURSE	157	34738.57149391	8.43	0.0

SOURCE	DF	TYPE III SS	F VALUE	PR > F
ID	188	61636.42752878	12.49	0.0
COURSE	157	34738.57149391	8.43	0.0

LAW SCHOOL DATA
GENERAL LINEAR MODEL STUDY
ALL STUDENTS, MINIMUM COURSE SIZE = 5
14:13 MONDAY, JUNE 10, 1991
GENERAL LINEAR MODELS PROCEDURE

	MEANS			MEANS			MEANS			MEANS	
ID	N	GRADE	ID	N	GRADE	ID	N	GRADE	ID	N	GRADE
1	24	28.9166667	53	21	34.7619048	105	8	26.2500000	163	17	30.0000000
2	4	26.5000000	54	22	28.8636364	106	23	35.6086957	165	20	27.6500000
3	18	37.6111111	55	22	34.9545455	107	21	33.4761905	166	22	33.6818182
4	18	27.3333333	56	21	25.3809524	108	21	33.7142857	167	22	35.8636364
5	20	25.9000000	57	23	30.4347826	109	9	32.7777778	168	23	25.3913043
6	17	35.5294118	58	22	35.4090909	110	2	22.0000000	169	3	21.3333333
7	21	30.3333333	59	22	24.2272727	112	22	32.9545455	171	17	33.1176471
8	8	35.0000000	60	9	24.5555556	113	21	30.7619048	172	22	29.5909091
9	16	36.6875000	61	8	33.8750000	114	9	25.2222222	173	17	33.0000000
10	13	23.9230769	62	17	32.3529412	115	18	27.0000000	174	20	29.8000000
11	4	18.5000000	63	24	33.2916667	116	24	31.1250000	175	17	30.6470588
12	21	35.6190476	64	12	31.6666667	118	21	34.3809524	176	20	31.9500000
13	19	23.1578947	65	23	23.9565217	119	23	26.5652174	177	22	30.8181818
14	19	31.7894737	66	24	33.4166667	120	23	26.4782609	178	22	28.8181818
15	25	28.3600000	67	23	31.2608696	121	23	22.9565217	179	20	23.0000000
16	14	22.3571429	68	24	27.6250000	122	22	31.2727273	180	23	35.2173913
17	24	29.0833333	69	15	35.5333333	124	22	35.7272727	181	21	27.9047619
18	12	24.8333333	70	24	32.7916667	125	22	25.2727273	182	4	25.7500000
19	20	30.3000000	72	19	33.6842105	127	22	31.7727273	183	18	28.2777778
20	23	31.2173913	73	17	28.2352941	128	9	35.7777778	184	5	28.6000000
21	23	27.5652174	74	7	30.2857143	129	23	29.2608696	185	9	33.3333333
22	17	26.0000000	75	24	37.5000000	130	6	29.0000000	186	19	25.1052632
24	23	35.6086957	76	24	23.2500000	131	23	27.7391304	188	2	36.5000000
25	22	32.1818182	77	19	27.6842105	132	20	34.3500000	189	5	28.0000000
26	22	33.7727273	79	21	37.5714286	133	22	29.6818182	190	19	33.1052632
27	12	20.5000000	80	17	34.4705882	134	24	33.2083333	192	23	28.7391304
28	22	30.6363636	81	22	22.0000000	135	25	25.6000000	193	25	29.3600000
29	18	30.7222222	82	21	34.4761905	136	20	24.5000000	194	23	28.3043478
30	23	32.0869565	83	19	36.7368421	138	22	31.7272727	195	19	26.3157895
32	25	27.4400000	84	2	21.5000000	139	19	34.9473684	196	14	27.0000000
33	20	34.8000000	85	13	26.6153846	140	9	28.7777778	197	22	22.6818182
34	5	27.4000000	86	23	31.0434783	141	23	36.0434783	198	21	33.4285714
35	15	21.6000000	87	24	22.0416667	142	22	32.9090909	199	20	36.0000000
36	25	28.8800000	88	11	31.5454545	143	22	37.2727273	200	21	26.0476190
37	11	20.7272727	89	22	29.7272727	144	19	27.8421053	201	26	29.3461538
38	19	26.3157895	90	22	33.7727273	145	22	22.8181818	202	17	29.2352941
39	19	34.7368421	91	13	31.6923077	146	17	29.8235294	203	4	25.7500000
40	21	24.8571429	92	24	29.2916667	147	21	31.9523810	204	23	30.4782609
41	14	27.1428571	93	20	34.1500000	148	21	33.7142857	205	24	30.5416667
42	22	24.7727273	94	21	24.9523810	149	21	29.0000000			
43	23	38.7826087	95	24	30.2916667	151	18	26.1666667			
44	22	29.4545455	96	20	29.3500000	152	21	36.1428571			
45	6	19.0000000	97	21	31.9047619	153	24	27.6250000			
46	22	27.0454545	98	18	28.2777778	154	20	33.6500000			
47	23	28.8260870	99	9	35.1111111	155	7	26.1428571			
48	21	27.2380952	100	22	27.0000000	156	21	29.9047619			
49	23	23.4347826	101	23	39.3913043	157	5	25.4000000			
50	22	27.4090909	102	18	30.5555556	159	14	22.0714286			
51	21	30.8095238	103	24	29.7083333	160	22	38.4545455			
52	21	36.2380952	104	21	36.9523810	161	25	31.4000000			

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LAW SCHOOL DATA
GENERAL LINEAR MODEL STUDY
ALL STUDENTS, MINIMUM COURSE SIZE = 5
14:13 MONDAY, JUNE 10, 1991

GENERAL LINEAR MODELS PROCEDURE

COURSE	N	GRADE
1	181	28.5303867
2	176	29.9602273
3	133	36.7443609
4	128	29.0390625
5	125	29.0320000
6	124	28.2419355
7	122	27.0245902
8	121	32.1900826
9	110	27.8181818
10	75	29.4533333
11	48	31.0208333
12	48	29.6458333
13	47	29.4255319
14	47	34.6595745
15	44	25.0909091
16	44	24.9772727
17	41	28.4634146
18	40	24.6750000
19	40	25.1000000
20	40	26.8500000
21	39	31.6153846
22	37	27.6486486
23	37	28.9459459
24	37	25.8378378
25	37	31.4864865
26	36	29.5833333
27	35	28.3428571
28	33	30.0303030
29	31	29.0000000
30	29	28.2068966
31	29	28.9655172
32	28	25.7500000
33	27	32.0740741
34	27	27.7407407
35	26	28.7692308
36	26	29.5000000
37	26	36.8461538
38	25	27.4400000
39	25	34.0000000
40	24	27.3750000
41	24	27.6666667
42	24	30.6250000
43	23	30.6956522
44	22	31.5909091
45	21	28.7619048
46	19	36.0526316
47	21	30.4761905
48	20	30.5000000
49	20	27.5000000
50	19	34.6315789
51	19	30.6842105
52	19	30.8421053
53	19	27.9473684
54	19	31.2631579
55	18	29.7222222
56	18	33.7777778
57	17	30.7058824

MEANS

COURSE	N	GRADE
58	17	34.5882353
59	16	31.5000000
60	16	30.5000000
61	14	24.8571429
62	13	38.3846154
63	13	28.4615385
64	13	32.0000000
65	13	28.2307692
66	12	26.1666667
67	12	33.2500000
68	12	37.5000000
69	12	28.5833333
70	11	37.4545455
71	11	26.1818182
72	11	31.1818182
73	11	31.6363636
74	11	36.8181818
75	11	34.4545455
76	11	30.1818182
77	11	32.9090909
78	11	25.8181818
79	10	36.4000000
80	9	34.1111111
81	10	34.0000000
82	10	38.4000000
83	10	33.7000000
84	10	30.3000000
85	10	35.6000000
86	9	28.5555556
87	9	28.4444444
88	9	28.2222222
89	9	35.4444444
90	9	34.4444444
91	9	29.6666667
92	9	31.4444444
93	9	32.5555556
94	9	32.1111111
95	9	35.3333333
96	9	29.7777778
97	9	27.5555556
98	9	30.7777778
99	8	36.0000000
100	8	34.1250000
101	8	34.1250000
102	8	34.6250000
103	8	31.3750000
104	8	31.8750000
105	8	29.2500000
106	8	38.6250000
107	8	37.6250000

MEANS

COURSE	N	GRADE
108	8	36.3750000
109	8	37.0000000
110	8	30.0000000
111	8	27.1250000
112	8	24.6250000
113	8	33.3750000
114	7	30.0000000
115	7	32.0000000
116	7	32.2857143
117	7	33.8571429
118	7	32.2857143
119	7	33.0000000
120	7	33.4285714
121	7	34.2857143
122	7	35.1428571
123	6	32.3333333
124	6	29.0000000
125	6	32.1666667
126	6	34.8333333
127	6	29.8333333
128	6	31.1666667
129	6	35.0000000
130	6	35.0000000
131	6	36.1666667
132	6	34.1666667
133	6	32.1666667
134	6	28.8333333
135	6	31.5000000
136	6	26.6666667
137	6	31.6666667
138	6	28.8333333
139	6	26.6666667
140	4	34.2500000
141	5	30.6000000
142	5	31.4000000
143	5	32.6000000
144	5	26.8000000
145	5	22.0000000
146	5	39.8000000
147	5	34.0000000
148	5	38.0000000
149	5	28.6000000
150	5	32.4000000
151	5	38.8000000
152	5	35.4000000
153	5	29.8000000
154	5	26.6000000
155	5	39.2000000
156	5	31.2000000
157	5	21.2000000
158	5	28.6000000

LAW SCHOOL DATA
GENERAL LINEAR MOOEL STUOY
ALL STUDENTS, MINIMUM COURSE SIZE = 5
14:13 MONOAY, JUNE 10, 1991

GENERAL LINEAR MODELS PROCEDURE

LEAST SQUARES MEANS

ID	GRADE LSMEAN	STO ERR LSMEAN	PROB > |T| HO:LSMEAN=O
1	29.9848628	1.0779139	0.0
2	26.9668297	2.5742994	0.0001
3	38.0430877	1.2401473	0.0
4	28.1095127	1.2492271	0.0
5	27.5931583	1.1895395	0.0
6	35.8411432	1.2761211	0.0
7	31.0913818	1.1463727	0.0
8	36.4078339	1.8241751	0.0
9	38.3171948	1.3153728	0.0
10	25.3374343	1.4634838	0.0001
11	19.0757939	2.5746180	0.0001
12	37.1745699	1.1665063	0.0
13	23.9805509	1.2237671	0.0
14	31.5348431	1.2104586	0.0
15	29.9003730	1.0780529	0.0
16	23.6136985	1.3903400	0.0001
17	30.6746022	1.0748720	0.0
18	24.3501354	1.5168373	0.0001
19	32.0871209	1.1752542	0.0
20	31.6459140	1.1094458	0.0
21	27.6479098	1.1017469	0.0
22	26.5146406	1.2790796	0.0
24	36.9386102	1.0974551	0.0
25	32.1501091	1.1348866	0.0
26	35.3199333	1.1174752	0.0
27	22.4091184	1.5220967	0.0001
28	31.1753476	1.1283472	0.0
29	28.7156055	1.2494948	0.0
30	32.6315832	1.0997013	0.0
32	28.8758676	1.0494990	0.0
33	35.3906276	1.1774336	0.0
34	27.3557475	2.3187109	0.0001
35	23.5076660	1.3554818	0.0001
36	27.9098101	1.0616071	0.0
37	22.5326900	1.5846475	0.0001
38	25.3448396	1.2136635	0.0
39	36.3318996	1.2040848	0.0
40	26.9165598	1.1392793	0.0
41	29.4884028	1.4077157	0.0
42	25.8874757	1.1174342	0.0
43	39.2320600	1.1043021	0.0
44	30.2578044	1.1235075	0.0
45	20.7030042	2.1263366	0.0001
46	28.6919326	1.1511599	0.0
47	29.8319170	1.0968061	0.0
48	27.9617577	1.1533073	0.0
49	24.8060069	1.1209357	0.0
50	27.2653756	1.1295565	0.0
51	32.2485264	1.1491516	0.0

LEAST SQUARES MEANS

ID	GRAOE LSMEAN	STD ERR LSMEAN	PROB > |T| HO:LSMEAN=O
52	37.6226256	1.1439805	0.0
53	36.2732692	1.1514260	0.0
54	30.6939624	1.1227018	0.0
55	36.9761554	1.1287608	0.0
56	25.4269603	1.1509200	0.0
57	31.1032330	1.1142895	0.0
58	36.8375863	1.1239576	0.0
59	25.0341456	1.1205592	0.0
60	26.2493920	1.7208211	0.0001
61	34.1148347	1.8658795	0.0001
62	33.1194283	1.2765707	0.0
63	34.8608276	1.0943939	0.0
64	33.6210947	1.4981020	0.0
65	26.1172888	1.0949294	0.0
66	34.1465039	1.0777960	0.0
67	31.7427985	1.0980660	0.0
68	29.3326265	1.0777699	0.0
69	36.8130308	1.3535797	0.0
70	34.6347629	1.0770121	0.0
72	35.2495178	1.2002782	0.0
73	28.8250670	1.2970730	0.0
74	31.1736270	1.9972097	0.0001
75	38.3465967	1.0791123	0.0
76	24.0221208	1.0805634	0.0
77	29.6087316	1.2210969	0.0
79	39.3616073	1.1435366	0.0
80	36.1604797	1.2843760	0.0
81	23.4918053	1.1158659	0.0
82	36.0690114	1.1393003	0.0
83	39.0126964	1.2138238	0.0
84	23.3871147	3.6356783	0.0001
85	27.3257586	1.4524176	0.0001
86	32.2240283	1.0965213	0.0
87	23.3780766	1.0746443	0.0
88	33.3478071	1.5863337	0.0
89	31.4365161	1.1196585	0.0
90	35.4595726	1.1213923	0.0
91	33.9564541	1.4627119	0.0
92	30.4887245	1.0740275	0.0
93	34.9294034	1.1761658	0.0
94	24.5149452	1.1577869	0.0
95	31.6908298	1.0731709	0.0
96	30.6532786	1.1861750	0.0
97	34.2827658	1.1387300	0.0
98	28.9364872	1.2540577	0.0
99	36.8049475	1.7208211	0.0
100	28.0426706	1.1367388	0.0
101	40.7942285	1.0963861	0.0
102	32.4885563	1.2486511	0.0

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LAW SCHOOL DATA
GENERAL LINEAR MODEL STUDY
ALL STUDENTS, MINIMUM COURSE SIZE = 5
14:13 MONDAY, JUNE 10, 1991

GENERAL LINEAR MODELS PROCEDURE

LEAST SQUARES MEANS

ID	GRADE LSMEAN	STD ERR LSMEAN	PROB > |T| HO:LSMEAN=0
103	30.1251851	1.0732954	0.0
104	38.4017914	1.1468557	0.0
105	25.6525152	1.8912375	0.0001
106	37.1242909	1.0974111	0.0
107	34.1745309	1.1497718	0.0
108	35.4021274	1.1410450	0.0
109	34.4716142	1.7208211	0.0
110	23.8871147	3.6356783	0.0001
112	32.4999711	1.1287237	0.0
113	32.8385890	1.1420617	0.0
114	26.3214053	1.7250726	0.0001
115	28.2018380	1.2341018	0.0
116	32.4277993	1.0761867	0.0
118	36.6433361	1.1512530	0.0
119	27.7466039	1.1156631	0.0
120	26.7748482	1.1017501	0.0
121	23.9570543	1.1005848	0.0
122	32.7216577	1.1506266	0.0
124	36.8847907	1.1475963	0.0
125	27.0498139	1.1194378	0.0
127	33.6868601	1.1418296	0.0
128	37.4716142	1.7208211	0.0
129	30.2020786	1.0941969	0.0
130	29.5274695	2.1275167	0.0001
131	28.4696860	1.0958612	0.0
132	35.3747227	1.1740117	0.0
133	31.6245881	1.1165383	0.0
134	34.7346232	1.0760022	0.0
135	26.3864180	1.0693498	0.0
136	25.5426768	1.1800498	0.0
138	33.3264144	1.1239016	0.0
139	36.4652616	1.2042278	0.0
140	30.4716142	1.7208211	0.0001
141	37.8449123	1.0980103	0.0
142	33.6115266	1.1216711	0.0
143	38.6072104	1.1244753	0.0
144	28.6711023	1.2064734	0.0
145	24.6696368	1.1471417	0.0
146	31.5230883	1.2741397	0.0
147	31.9955478	1.1738414	0.0
148	35.1167198	1.1499184	0.0
149	30.5503127	1.1695431	0.0
151	27.3225025	1.2479935	0.0
152	37.3107443	1.1448043	0.0
153	28.9010827	1.0951174	0.0
154	34.8171043	1.1756039	0.0
155	27.5329475	1.9715947	0.0001
156	31.6237611	1.1488187	0.0
157	24.7248812	2.3264141	0.0001

LEAST SQUARES MEANS

ID	GRADE LSMEAN	STD ERR LSMEAN	PROB > |T| HO:LSMEAN=0
159	23.4621746	1.3951256	0.0001
160	40.1267667	1.1216552	0.0
161	32.2362842	1.0594997	0.0
163	31.2938753	1.2860712	0.0
165	28.0458321	1.1830821	0.0
166	35.0509937	1.1279466	0.0
167	37.4164001	1.1211795	0.0
168	26.8442602	1.1193687	0.0
169	20.7737729	2.9706116	0.0001
171	34.5355095	1.2663200	0.0
172	31.1332282	1.1371119	0.0
173	33.8608004	1.2906841	0.0
174	31.8993761	1.1674155	0.0
175	32.8252809	1.2660368	0.0
176	33.1446157	1.1746197	0.0
177	31.8920266	1.1236456	0.0
178	30.2099605	1.1183331	0.0
179	24.5503940	1.1769774	0.0
180	37.3053713	1.1132338	0.0
181	29.7292391	1.1624979	0.0
182	25.4971942	2.5754462	0.0001
183	29.3525904	1.2414106	0.0
184	30.2023182	2.3880777	0.0001
185	35.0271698	1.7208211	0.0
186	27.0624334	1.2269495	0.0
188	38.3871147	3.6356783	0.0001
189	29.1698351	2.3040965	0.0001
190	34.1096271	1.2051962	0.0
192	30.3679327	1.0951325	0.0
193	30.2982748	1.0521613	0.0
194	30.1526711	1.1033617	0.0
195	28.0760919	1.2032153	0.0
196	28.0229146	1.4194487	0.0
197	24.0412433	1.1218134	0.0
198	34.3608793	1.1484067	0.0
199	36.9127452	1.1762789	0.0
200	27.1613532	1.1670607	0.0
201	29.9508815	1.0355007	0.0
202	30.1112053	1.2748854	0.0
203	26.2168297	2.5742994	0.0001
204	29.4656409	1.1032848	0.0
205	31.6424871	1.0744288	0.0

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LAW SCHOOL DATA
GENERAL LINEAR MODEL STUDY
ALL STUDENTS, MINIMUM COURSE SIZE = 5
14:13 MONDAY, JUNE 10, 1991

GENERAL LINEAR MODELS PROCEDURE

LEAST SQUARES MEANS

COURSE	GRADE LSMEAN	STD ERR LSMEAN	PROB > |T| HO:LSMEAN=0
1	28.4433989	0.3818319	0.0
2	29.6796907	0.3877972	0.0
3	36.4015700	0.4570478	0.0
4	28.4721870	0.4670618	0.0
5	28.3530253	0.4728853	0.0
6	27.4026596	0.4737645	0.0
7	26.0853679	0.4789164	0.0
8	31.4887053	0.4801823	0.0
9	26.9668028	0.5033994	0.0
10	29.7884563	0.6069430	0.0
11	31.5977304	0.7907548	0.0
12	28.8413694	0.7602066	0.0
13	29.7770741	0.8006628	0.0
14	35.3163930	0.8016978	0.0
15	25.6445404	0.8230349	0.0
16	24.4297356	0.8038393	0.0
17	29.7537459	0.8368146	0.0
18	24.7181229	0.8633913	0.0
19	25.1390337	0.8611623	0.0
20	26.3641819	0.8325491	0.0
21	31.7480031	0.8743308	0.0
22	26.6128081	0.8669537	0.0
23	28.4487645	0.8672390	0.0
24	26.7123655	0.8891643	0.0
25	29.5428925	0.8642408	0.0
26	29.3913649	0.8767331	0.0
27	27.7396177	0.8909253	0.0
28	28.4797925	0.9196535	0.0
29	26.8874304	0.9459209	0.0
30	26.5202908	0.9783175	0.0
31	28.2060016	0.9765859	0.0
32	25.9655030	0.9939046	0.0
33	32.8029189	1.0342162	0.0
34	27.8354460	1.0365463	0.0
35	28.1974177	1.0305594	0.0
36	29.7762292	1.0590642	0.0
37	36.4703712	1.0331898	0.0
38	27.8643374	1.0549392	0.0
39	33.3518222	1.0517936	0.0
40	26.0622816	1.0746924	0.0
41	27.6540371	1.0742291	0.0
42	30.4773929	1.0972827	0.0
43	29.6682327	1.0980234	0.0
44	30.3875597	1.1206888	0.0
45	27.6244451	1.1538734	0.0
46	35.6454913	1.2087791	0.0
47	29.3778811	1.1465370	0.0
48	29.5148055	1.1772173	0.0
49	28.7149886	1.1855547	0.0

LEAST SQUARES MEANS

COURSE	GRADE LSMEAN	STD ERR LSMEAN	PROB > |T| HO:LSMEAN=0
50	38.0335051	1.2093300	0.0
51	28.8848478	1.2203720	0.0
52	29.1469383	1.2089966	0.0
53	27.5042639	1.2079211	0.0
54	29.7253575	1.2074289	0.0
55	29.9400317	1.2467179	0.0
56	34.2597583	1.2407182	0.0
57	31.3391178	1.2924917	0.0
58	34.1343969	1.2719850	0.0
59	29.7397836	1.3220889	0.0
60	29.2398551	1.3153361	0.0
61	26.1684658	1.4158457	0.0001
62	37.0327638	1.4574702	0.0
63	29.5961664	1.4663528	0.0
64	29.2277775	1.4581194	0.0
65	27.7829361	1.4758671	0.0001
66	26.3578227	1.5183824	0.0001
67	30.7026763	1.5169967	0.0
68	33.9448560	1.5182256	0.0
69	27.9853837	1.5275440	0.0001
70	36.4005241	1.5918848	0.0
71	26.1331608	1.5842670	0.0001
72	30.5296877	1.5866924	0.0001
73	29.6567161	1.5854874	0.0001
74	36.1250627	1.5850037	0.0
75	32.3463967	1.5845293	0.0
76	29.3618658	1.5828739	0.0001
77	33.3718974	1.5836919	0.0
78	26.3245316	1.5959385	0.0001
79	32.7212492	1.6626835	0.0
80	32.8217017	1.7564992	0.0001
81	34.8419317	1.6631154	0.0
82	36.9896098	1.6600291	0.0
83	31.4609241	1.6611343	0.0001
84	32.5493624	1.6713176	0.0
85	34.8730910	1.6619117	0.0
86	26.5968101	1.7517028	0.0001
87	28.9292285	1.7494007	0.0001
88	27.7075308	1.7555151	0.0001
89	36.7740428	1.7493398	0.0
90	34.8178754	1.7509583	0.0
91	28.2261662	1.7535320	0.0001
92	29.1069189	1.7495290	0.0001
93	32.0765565	1.7486504	0.0001
94	29.3211890	1.7531753	0.0001
95	36.6783566	1.7679842	0.0
96	31.0995760	1.7674898	0.0001
97	29.7353018	1.7714329	0.0001
98	32.7005996	1.7639039	0.0001

LAW SCHOOL DATA
GENERAL LINEAR MODEL STUDY
ALL STUDENTS, MINIMUM COURSE SIZE = 5
14:13 MONDAY, JUNE 10, 1991
GENERAL LINEAR MODELS PROCEDURE

LEAST SQUARES MEANS

COURSE	GRADE LSMEAN	STD ERR LSMEAN	PROB > |T| HO:LSMEAN=0
99	33.5305217	1.8584573	0.0001
100	31.8330233	1.8764811	0.0001
101	33.5340819	1.8600274	0.0001
102	37.0362488	1.8589969	0.0
103	29.4436287	1.8587360	0.0001
104	27.6159471	1.8575224	0.0001
105	29.7565717	1.8572463	0.0001
106	39.2312976	1.8594054	0.0
107	36.3036092	1.8554051	0.0
108	38.2227163	1.8601773	0.0
109	35.3314880	1.8582839	0.0001
110	28.9073098	1.8602415	0.0001
111	28.8050622	1.8684202	0.0001
112	26.4442001	1.8712154	0.0001
113	35.0138480	1.8741655	0.0001
114	32.0492245	1.9871198	0.0001
115	34.9760187	2.0073750	0.0001
116	29.3352865	1.9836372	0.0001
117	30.7511210	1.9862686	0.0001
118	30.9818452	1.9883237	0.0001
119	35.4449744	1.9853476	0.0001
120	32.6394359	1.9852153	0.0001
121	33.5036520	1.9970966	0.0001
122	33.6571747	2.0004146	0.0001
123	31.4962881	2.1456624	0.0001
124	25.5343655	2.1458389	0.0001
125	32.8797318	2.1603621	0.0001
126	33.1786032	2.1423217	0.0001
127	32.8768285	2.1705254	0.0001
128	33.7572374	2.1712430	0.0001
129	35.1720917	2.1443539	0.0001
130	33.8660042	2.1491489	0.0001
131	34.4394526	2.1453511	0.0001
132	34.3618614	2.1422461	0.0001
133	36.2055361	2.1425734	0.0001
134	33.0967902	2.1466650	0.0001
135	34.0169309	2.1612931	0.0001
136	25.9045068	2.1470250	0.0001
137	31.0438930	2.1447076	0.0001
138	29.6546765	2.1421023	0.0001
139	26.7151034	2.1550848	0.0001
140	34.4199225	2.6325002	0.0001
141	27.3230040	2.3496484	0.0001
142	31.7190886	2.3501368	0.0001
143	36.5261552	2.3512285	0.0001
144	26.4711565	2.3452894	0.0001
145	26.2950638	2.3625711	0.0001
146	35.1054286	2.3482663	0.0001
147	36.5939826	2.3518463	0.0001

LEAST SQUARES MEANS

COURSE	GRADE LSMEAN	STD ERR LSMEAN	PROB > |T| HO:LSMEAN=0
148	33.2000775	2.3551798	0.0001
149	33.3525588	2.3657867	0.0001
150	33.1012197	2.3640325	0.0001
151	38.8474298	2.3517392	0.0001
152	37.7162506	2.3586163	0.0001
153	30.3747971	2.3550174	0.0001
154	28.3167698	2.3463369	0.0001
155	34.5104254	2.3471837	0.0001
156	31.2503840	2.3566174	0.0001
157	23.9907381	2.3593119	0.0001
158	28.8567052	2.3664268	0.0001